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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/670,990	09/25/2003	James E. Boyle	3816.09	4518

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EXAMINER	
BROWN, JAYME L	

ART UNIT	PAPER NUMBER
1733	

DATE MAILED: 12/19/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/670,990	BOYLE ET AL.	
	Examiner	Art Unit	
	Jayme L. Brown	1733	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *22 September 2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-27 and 33-37* is/are pending in the application.

4a) Of the above claim(s) *19-27* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-18 and 33-37* is/are rejected.

7)☒ Claim(s) *1* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *25 September 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *12/2/05*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Election/Restrictions

1. Applicant's election with traverse of Group I, claims 1-18 in the reply filed on 9/22/05 is acknowledged. The traversal is on the ground(s) that the classification of Group II in class 428/119 is incorrect. This is not found persuasive because the product as claimed can be made by another materially different process such as one where the composite is not a flowable mixture of silicon powder with a silicon bridging agent.

The requirement is still deemed proper and is therefore made FINAL.

Information Disclosure Statement

2. The information disclosure statement (IDS) submitted on 12/2/05 has been considered by the examiner.

Claim Objections

3. Claim 1 is objected to because of the following informalities:

In line 2, "the step" should be changed to - - the steps - -.

Appropriate correction is required.

Claim Rejections - 35 USC § 112

4. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the

> art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

5. Claim 34 is rejected under 35 U.S.C. 112, first paragraph, because the specification, while being enabling for silica bridging agent, does not reasonably provide enablement for glass forming agent. The specification does not enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make the invention commensurate in scope with these claims. The Specification does not provide what the term "glass forming agent" encompasses.

6. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

7. Claim 34 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

a. Claim 34 recites the limitation "said two silicon parts" in line 4. There is insufficient antecedent basis for this limitation in the claim. It is recommended that line 1 of claim 34 be amended to say - - A method of joining two silicon parts along respective joining areas, comprising: - -.

b. Also regarding claim 34, the term "glass forming agent" is unclear because it is not clear what is encompassed by this term as noted above in paragraph .

Claim Rejections - 35 USC § 102

8. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

9. Claims 1, 2, 4, 5, and 33-35 are rejected under 35 U.S.C. 102(b) as being anticipated by Stokes et al. (U.S. Patent 3,833,348).

Regarding claim 1, Stokes et al. discloses a method of joining two silicon parts along respective joining areas, comprising the steps: providing a flowable mixture of a silicon powder and a silica bridging agent, applying said flowable mixture to at least one of said joining areas, assembling said two silicon parts with said respective joining areas in juxtaposition, and annealing said assembled parts at an annealing temperature sufficient to convert said silica bridging agent to a silica network (Abstract; Column 1, lines 1-23 and 37-66). Stokes et al. anticipates claim 1.

Regarding claim 2, Stokes et al. teaches that the annealing temperature is at least 400°C (Column 1, line 46 – Column 2, line 13).

Regarding claim 4, Stokes et al. teaches that the annealing temperature is at least 1200°C (Column 1, line 46 – Column 2, line 13).

Regarding claim 5, Stokes et al. teaches that the annealing temperature is at least 1300°C (Column 1, line 46 – Column 2, line 13).

Regarding claim 33, Stokes et al. teaches that the two silicon parts are bonded together through the silica network after the annealing step (Column 1, lines 37-45).

Regarding claim 34, Stokes et al. discloses a method of joining two silicon parts along respective joining areas, comprising: providing a flowable mixture of a silicon powder and a glass forming agent, applying said flowable mixture to at least one of said joining areas, assembling said two silicon parts with said respective joining areas being opposed to each other, and heating said assembled parts at an elevated temperature sufficient to convert the glass forming agent into a glass bonded to both of the joining areas (Abstract; Column 1, lines 1-23 and 37-66). Stokes et al. anticipates claim 34.

Regarding claim 35, Stokes et al. teaches that the glass comprises a silicate glass (Column 1, lines 45-60).

Claim Rejections - 35 USC § 103

10. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

11. Claims 1-8, 12-14, 18, and 33-36 are rejected under 35 U.S.C. 103(a) as being unpatentable over the Admitted Prior Art in view of Kurz (U.S. Patent 3,707,386).

Regarding claim 1, the Admitted Prior Art teaches a method of joining two silicon parts along respective joining areas, comprising the steps: providing a flowable silica bridging agent, applying said flowable silica bridging agent to at least one of said joining areas, assembling said two silicon parts with said respective joining areas in juxtaposition, and annealing said assembled parts at an annealing temperature

sufficient to convert said silica bridging agent to a silica network. The Admitted Prior Art is silent toward the flowable silica bridging agent also containing a silicon powder.

Kurz is directed to glass bonding compositions and teaches adding silicon powder to water glass (sodium silicate), which is a strong binding agent, in order to increase the SO_2 content (Column 1, lines 15-28; Column 1, line 59 – Column 2, line 9). One skilled in the art would have readily appreciated adding silicon powder to the silica bridging agent (glass) in order to increase the content of SO_2 and make the bridging agent more pure and stronger (better resistance to moisture; Column 1, lines 28-29). It would have been obvious to one of ordinary skill in the art at the time the invention was made to add silicon powder to the silica bridging agent in the method of the Admitted Prior Art as suggested by Kurz.

Regarding claims 2-5, the Admitted Prior Art teaches that the annealing temperature is 600°C and above.

Regarding claim 6, it is known that silicon powder comprising virgin polysilicon is commercially available as exemplified in the Specification.

Regarding claim 7, Kurz teaches that the silicon powder has a size of less than 100μm (Column 2, lines 25-26).

Regarding claim 8, Kurz teaches that the silicon powder has a size between 1 and 50μm (Column 2, lines 25-26).

Regarding claim 12, the Admitted Prior Art teaches that the silica bridging agent comprises a silicone-containing material.

Regarding claim 13, the Admitted Prior Art teaches that said silica bridging agent comprises a spin-on glass.

Regarding claim 14, the limitations are addressed above in claims 1 and 13.

Regarding claim 18, the Admitted Prior Art teaches that the parts form a wafer support fixture.

Regarding claim 33, the Admitted Prior Art teaches that the two silicon parts are bonded together through the silica network after the annealing step.

Regarding claim 34, the limitations are addressed above in claim 1.

Regarding claim 35, Kurz teaches that the glass comprises silicate glass (Column 1, line 27).

Regarding claim 36, the Admitted Prior Art teaches that the glass forming agent comprises a silica spin-on glass.

12. Claims 9, 10, 17, and 37 are rejected under 35 U.S.C. 103(a) as being unpatentable over the Admitted Prior Art in view of Kurz (U.S. Patent 3,707,386), as applied to claims 1-8, 12-14, 18, and 33-36 above, and further in view of Canham et al. (U.S. Patent 6,832,716).

Regarding claim 9, the Admitted Prior Art and Kurz are relied upon for the teachings above. Kurz also teaches have the silicon powder finely ground into small particles have a size, for example, of 1 micron (Column 6, line 26 and 57-66). The Admitted Prior Art is silent toward the silicon powder having a size distribution with a median size in the range of 10nm to 25nm.

Canham et al. is directed to bonding silicon components using nanocrystalline silicon powder as a boding material (Column 1, lines 10-33; Column 8, lines 42-62). One skilled in the art would have readily appreciated using silicon powder having a median size in the range of 10nm to 25nm, since it is known and conventional as exemplified by Canham et al. (Column 3, lines 50-55). It would have been obvious to one of ordinary skill in the art at the time the invention was made to have the silicon powder in the median size range of 10nm to 25nm in the method of the Admitted Prior Art, as modified above, as suggested by Canham et al.

Regarding claims 10, 17, and 37, one skilled in the art would have readily appreciated having the silicon powder with a size distribution that has at least 99% of the particles having a size of less than 100nm. Canham et al. teaches that the silicon powder has a size less than 100nm (Column 3, lines 50-55). One skilled in the art would have readily appreciated that 99% of the particles have a size of less than 100nm, so that the particles are closer to being the same size and are more evenly distributed throughout the silica bridging agent. It would have been obvious to one of ordinary skill in the art at the time the invention was made to have 99% of the particles with a size of less than 100nm in the method of the Admitted Prior Art, as modified above, as suggested by Canham et al., in order to control the consistency and distribution of flowable mixture.

13. Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over the Admitted Prior Art in view of Kurz (U.S. Patent 3,707,386), as applied to claims 1-8, 12-

14, 18, and 33-36 above, and further in view of Nagano et al. (U.S. Pub. 2002/0149082) and Kosakai (U.S. Pub. 2002/0044404).

Regarding claim 11, the Admitted Prior Art and Kurz are relied upon for the teachings above. The Admitted Prior Art is silent toward the silicon powder being formed by a CVD process creating particles of silicon. It is known in the art to make silicon particles from the CVD process as exemplified by Nagano et al. (Page 5, paragraph [0084]) and Kosakai (Page 4, paragraph [0066]). It would have been obvious to one of ordinary skill in the art at the time the invention was made to make the silicon powder from a CVD process in the method of the Admitted Prior Art, as modified above, as suggested by Nagano et al. and Kosakai, since it is a known process in the art.

14. Claims 16 and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over the Admitted Prior Art in view of Kurz (U.S. Patent 3,707,386), as applied to claims 1-8, 12-14, 18, and 33-36 above, and further in view of Yamada et al. (U.S. Patent 5,945,475) and/or Beredjick (U.S. Patent 3,273,957).

Regarding claims 16 and 17, the Admitted Prior Art and Kurz are relied upon for the teachings above. The Admitted Prior Art is silent toward the flowable mixture comprising a retardant that comprises an alcohol including less than 1% water. One skilled in the art would readily appreciate using a retardant to slow the setting in order to make adjustments to the silicon parts before the silica bridging agent is fully set. Also, one skilled in the art would have readily recognized that it is known to use a retardant that comprises alcohol as exemplified by Yamada et al. (Column 3, lines 20-21) and

Beredjick (Column 2, lines 12-15; Column 4, lines 14-18). It would have been obvious to one of ordinary skill in the art at the time the invention was made to use a retardant comprising alcohol in the method of the Admitted Prior Art, as modified above, as suggested by Yamada et al. and/or Beredjick since it is conventional and slowing the setting of the silica bridging agent allows for adjustment of the silicon parts.

Response to Arguments

15. Applicant's arguments with respect to claims 1-18 have been considered but are moot in view of the new ground(s) of rejection.

Applicant argues that the Sadatoshi reference fails to teach a silica bridging agent that converts to a silica network upon the step of annealing. The new rejections above address the flowable mixture of a silicon powder and a silica bridging agent that forms a silica network upon the step of annealing.

Conclusion

16. Any inquiry concerning this communication or earlier communications from the examiner should be directed to **Jayme L. Brown** whose telephone number is **571-272-8386**. The examiner can normally be reached on M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Richard Crispino can be reached on 571-272-1226. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Jayme L. Brown

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PRIMARY EXAMINER